

$N(2190) 7/2^-$

$$I(J^P) = \frac{1}{2}(\frac{7}{2}^-) \text{ Status: } ****$$

Most of the results published before 1975 were last included in our 1982 edition, Physics Letters **111B** 1 (1982). Some further obsolete results published before 1984 were last included in our 2006 edition, Journal of Physics, G **33** 1 (2006).

NODE=B071

NODE=B071

N(2190) BREIT-WIGNER MASS

NODE=B071M

NODE=B071M

→ UNCHECKED ←

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2100 to 2200 (≈ 2190) OUR ESTIMATE			
2180 ± 20	ANISOVICH	12A	DPWA Multichannel
2152.4 ± 1.4	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
2200 ± 70	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
2140 ± 12	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
2140 ± 40	HENDRY	78	MPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
2150 ± 26	SHRESTHA	12A	DPWA Multichannel
2125 ± 61	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
2192.1 ± 8.7	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$
2168 ± 18	VRANA	00	DPWA Multichannel
2131	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
2127 ± 9	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$
2180	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$

N(2190) BREIT-WIGNER WIDTH

NODE=B071W

NODE=B071W

→ UNCHECKED ←

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
300 to 700 (≈ 500) OUR ESTIMATE			
335 ± 40	ANISOVICH	12A	DPWA Multichannel
484 ± 13	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
500 ± 150	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
390 ± 30	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
270 ± 50	HENDRY	78	MPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
500 ± 74	SHRESTHA	12A	DPWA Multichannel
381 ± 160	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
726 ± 62	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$
453 ± 101	VRANA	00	DPWA Multichannel
476	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
550 ± 50	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$
80	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$

N(2190) POLE POSITION

NODE=B071215

REAL PART

NODE=B071RE

NODE=B071RE

→ UNCHECKED ←

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2050 to 2100 (≈ 2075) OUR ESTIMATE			
2150 ± 25	ANISOVICH	12A	DPWA Multichannel
2070	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
2042	¹ HOEHLER	93	SPED $\pi N \rightarrow \pi N$
2100 ± 50	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
2062	SHRESTHA	12A	DPWA Multichannel
2063 ± 32	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
2076	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$
2107	VRANA	00	DPWA Multichannel
2030	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
2060	ARNDT	91	DPWA $\pi N \rightarrow \pi N$ Soln SM90

-2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
400 to 520 (\approx 450) OUR ESTIMATE			
330± 30	ANISOVICH	12A	DPWA Multichannel
520	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
482	¹ HOEHLER	93	SPED $\pi N \rightarrow \pi N$
400±160	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
428	SHRESTHA	12A	DPWA Multichannel
330±101	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
502	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$
380	VRANA	00	DPWA Multichannel
460	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
464	ARNDT	91	DPWA $\pi N \rightarrow \pi N$ Soln SM90

NODE=B071IM
 NODE=B071IM
 → UNCHECKED ←

N(2190) ELASTIC POLE RESIDUE**MODULUS $|r|$**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
30± 5	ANISOVICH	12A	DPWA Multichannel
72	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
45	HOEHLER	93	SPED $\pi N \rightarrow \pi N$
25±10	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
34	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
68	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$
46	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
54	ARNDT	91	DPWA $\pi N \rightarrow \pi N$ Soln SM90

NODE=B071220

NODE=B071RER
 NODE=B071RER

PHASE θ

VALUE (°)	DOCUMENT ID	TECN	COMMENT
30±10	ANISOVICH	12A	DPWA Multichannel
-32	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
-30±50	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-19	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
-32	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$
-23	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
-44	ARNDT	91	DPWA $\pi N \rightarrow \pi N$ Soln SM90

NODE=B071IMR
 NODE=B071IMR

N(2190) INELASTIC POLE RESIDUE

The "normalized residue" is the residue divided by $\Gamma_{pole}/2$.

Normalized residue in $N\pi \rightarrow N(2190) \rightarrow \Lambda K$

MODULUS (%)	PHASE (°)	DOCUMENT ID	TECN	COMMENT
3±1	20 ± 15	ANISOVICH	12A	DPWA Multichannel

NODE=B071250

NODE=B071250

NODE=B071RS1
 NODE=B071RS1

N(2190) DECAY MODES

The following branching fractions are our estimates, not fits or averages.

Mode	Fraction (Γ_i/Γ)
Γ_1 $N\pi$	10–20 %
Γ_2 $N\eta$	(0.0±1.0) %
Γ_3 $N\omega$	seen
Γ_4 ΛK	seen
Γ_5 ΣK	
Γ_6 $N\pi\pi$	seen
Γ_7 $N\rho$	seen
Γ_8 $p\gamma$	0.02–0.06 %
Γ_9 $p\gamma$, helicity=1/2	0.02–0.04 %
Γ_{10} $p\gamma$, helicity=3/2	0.002–0.02 %

NODE=B071225;NODE=B071

NODE=B071

DESIG=1;OUR EST

DESIG=2

DESIG=178

DESIG=3;OUR EVAL

DESIG=4

DESIG=5;OUR EVAL

DESIG=14;OUR EVAL

DESIG=11;OUR EST

DESIG=7;OUR EST

DESIG=8;OUR EST

N(2190) BRANCHING RATIOS

NODE=B071230

$\Gamma(N\pi)/\Gamma_{\text{total}}$					Γ_1/Γ
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
10 to 20 OUR ESTIMATE					
16 ± 2	ANISOVICH	12A	DPWA	Multichannel	
23.8 ± 0.1	ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$	
12 ± 6	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$	
14 ± 2	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$	
16 ± 4	HENDRY	78	MPWA	$\pi N \rightarrow \pi N$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
20 ± 1	SHRESTHA	12A	DPWA	Multichannel	
18 ± 12	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$	
23.0 ± 0.2	ARNDT	04	DPWA	$\pi N \rightarrow \pi N, \eta N$	
20 ± 4	VRANA	00	DPWA	Multichannel	
23	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$	
22 ± 1	MANLEY	92	IPWA	$\pi N \rightarrow \pi N \& N\pi\pi$	

NODE=B071R1
 NODE=B071R1
 → UNCHECKED ←

$\Gamma(N\eta)/\Gamma_{\text{total}}$					Γ_2/Γ
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
0 ± 1	VRANA	00	DPWA	Multichannel	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2 ± 1	SHRESTHA	12A	DPWA	Multichannel	
0.1 ± 0.3	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$	

NODE=B071R8
 NODE=B071R8

$\Gamma(N\omega)/\Gamma_{\text{total}}$					Γ_3/Γ
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
seen	WILLIAMS	09	IPWA	$\gamma p \rightarrow p\omega$	

NODE=B071R11
 NODE=B071R11

$\Gamma(\Lambda K)/\Gamma_{\text{total}}$					Γ_4/Γ
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
0.5 ± 0.3	ANISOVICH	12A	DPWA	Multichannel	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1	SHRESTHA	12A	DPWA	Multichannel	

NODE=B071R12
 NODE=B071R12

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(2190) \rightarrow \Lambda K$					$(\Gamma_1\Gamma_4)^{1/2}/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT		
-0.02	BELL	83	DPWA	$\pi^- p \rightarrow \Lambda K^0$	
-0.02	SAXON	80	DPWA	$\pi^- p \rightarrow \Lambda K^0$	

NODE=B071R3
 NODE=B071R3

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(2190) \rightarrow N\rho, S=3/2, D\text{-wave}$					$(\Gamma_1\Gamma_0)^{1/2}/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT		
• • • We do not use the following data for averages, fits, limits, etc. • • •					
-0.13 ± 0.05	SHRESTHA	12A	DPWA	Multichannel	
-0.25 ± 0.03	MANLEY	92	IPWA	$\pi N \rightarrow \pi N \& N\pi\pi$	

NODE=B071R5
 NODE=B071R5

$\Gamma(N\rho, S=3/2, D\text{-wave})/\Gamma_{\text{total}}$					Γ_0/Γ
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
29 ± 28	VRANA	00	DPWA	Multichannel	

NODE=B071R9
 NODE=B071R9

N(2190) PHOTON DECAY AMPLITUDES

NODE=B071235

Papers on γN amplitudes predating 1981 may be found in our 2006 edition, Journal of Physics, G **33** 1 (2006).

NODE=B071235

N(2190) → pγ, helicity-1/2 amplitude A_{1/2}

VALUE (GeV ^{-1/2})	DOCUMENT ID	TECN	COMMENT	
-0.065 ± 0.008	ANISOVICH	12A	DPWA	Multichannel

NODE=B071A1
 NODE=B071A1

N(2190) → pγ, helicity-3/2 amplitude A_{3/2}

VALUE (GeV ^{-1/2})	DOCUMENT ID	TECN	COMMENT	
0.035 ± 0.017	ANISOVICH	12A	DPWA	Multichannel

NODE=B071A2
 NODE=B071A2

$N(2190) \rightarrow p\gamma$, ratio of helicity amplitudes $A_{3/2}/A_{1/2}$

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-0.17 ± 0.15	WILLIAMS	09	IPWA $\gamma p \rightarrow p\omega$

NODE=B071A01
 NODE=B071A01

 $N(2190) \quad \gamma p \rightarrow \Lambda K^+$ AMPLITUDES

NODE=B071240

 $(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $p\gamma \rightarrow N(2190) \rightarrow \Lambda K^+$ (E_{4-} amplitude)

VALUE (units 10^{-3})	DOCUMENT ID	TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •		
2.5 ± 1.0	WORKMAN	90 DPWA
2.04	TANABE	89 DPWA

NODE=B071LK1
 NODE=B071LK1

 $p\gamma \rightarrow N(2190) \rightarrow \Lambda K^+$ phase angle θ (E_{4-} amplitude)

VALUE (degrees)	DOCUMENT ID	TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •		
-4 ± 9	WORKMAN	90 DPWA
-27.5	TANABE	89 DPWA

NODE=B071LP1
 NODE=B071LP1

 $(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $p\gamma \rightarrow N(2190) \Rightarrow \Lambda K^+$ (M_{4-} amplitude)

VALUE (units 10^{-3})	DOCUMENT ID	TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •		
-7.0 ± 0.7	WORKMAN	90 DPWA
-5.78	TANABE	89 DPWA

NODE=B071LK2
 NODE=B071LK2

 $N(2190)$ FOOTNOTES

¹ See HOEHLER 93 for a detailed discussion of the evidence for and the pole parameters of N and Δ resonances as determined from Argand diagrams of πN elastic partial-wave amplitudes and from plots of the speeds with which the amplitudes traverse the diagrams.

NODE=B071

NODE=B010;LINKAGE=H9

 $N(2190)$ REFERENCES

NODE=B071

For early references, see Physics Letters **111B** 1 (1982).

NODE=B071

ANISOVICH	12A	EPJ A48 15	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)	REFID=54041
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)	REFID=54862
BATINIC	10	PR C82 038203	M. Batinic <i>et al.</i>	(ZAGR)	REFID=53552
WILLIAMS	09	PR C80 065209	M. Williams <i>et al.</i>	(CEBAF CLAS Collab.)	REFID=53186
ARNDT	06	PR C74 045205	R.A. Arndt <i>et al.</i>	(GWU)	REFID=51535
PDG	06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)	REFID=51004
ARNDT	04	PR C69 035213	R.A. Arndt <i>et al.</i>	(GWU, TRIU)	REFID=49947
VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman, T.-S.H. Lee	(PITT+)	REFID=47593
ARNDT	95	PR C52 2120	R.A. Arndt <i>et al.</i>	(VPI, BRCO)	REFID=44535
HOEHLER	93	πN Newsletter 9 1	G. Hohler	(KARL)	REFID=43821
MANLEY	92	PR D45 4002	D.M. Manley, E.M. Saleski	(KSA) IJP	REFID=41535
Also		PR D30 904	D.M. Manley <i>et al.</i>	(VPI)	REFID=30071
ARNDT	91	PR D43 2131	R.A. Arndt <i>et al.</i>	(VPI, TELE) IJP	REFID=41467
WORKMAN	90	PR C42 781	R.L. Workman	(VPI)	REFID=43685
TANABE	89	PR C39 741	H. Tanabe, M. Kohno, C. Bennhold	(MANZ)	REFID=40997
Also		NC 102A 193	M. Kohno, H. Tanabe, C. Bennhold	(MANZ)	REFID=40998
BELL	83	NP B222 389	K.W. Bell <i>et al.</i>	(RL) IJP	REFID=30409
PDG	82	PL 111B 1	M. Roos <i>et al.</i>	(HELS, CIT, CERN)	REFID=41167
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP	REFID=30064
Also		PR D20 2839	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP	REFID=40096
SAXON	80	NP B162 522	D.H. Saxon <i>et al.</i>	(RHEL, BRIS) IJP	REFID=30404
HOEHLER	79	PDAT 12-1	G. Hohler <i>et al.</i>	(KARLT) IJP	REFID=30058
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP	REFID=30859
HENDRY	78	PRL 41 222	A.W. Hendry	(IND, LBL) IJP	REFID=30893
Also		ANP 136 1	A.W. Hendry	(IND)	REFID=30901